## CLAIMS

1. A metal element coated at least partially with a self-assembled coating layer, said self-assembled coating layer comprising an inherently conductive polymer and at least one negative group, whereby said inherently conductive polymer is functioning as a backbone structure for said negative group.

2. A metal element according to claim 1, whereby said self-assembled coating layer is formed by electrochemical anodic polymerisation starting from a solution of a monomer of an inherently conductive polymer and at least one dopant, said negative group being derived from said dopant.

3. A metal element according to claim 2, whereby said metal element is functioning as anode during said polymerisation.

4. A metal element according to any one of the preceding claims, whereby said inherently conductive polymer is selected from the group consisting of polyaniline, polypyrrole, polythiophene, polyphenylenevinylene, polydiacetylene, polyacetylene, polyquinoline, polyphenylenevinylene, polyheteroarylenvinylene and derivatives, copolymers and mixtures thereof.

5. A metal element according to any one of the preceding claims, whereby said negative group comprises an inorganic or organic negative group.

6. A metal element according to any one of the preceding claims, whereby said self-assembled coating layer has a thickness between 1 nm and 1000 nm.

7. A metal element according to any one of the preceding claims, whereby said said self-assembled coating layer has a thickness between 10 and 100 nm and a porosity of less than 1 %.

8. A metal element according to any one of the preceding claims, whereby said self-assembled coating layer comprising an inherently conductive polymer and at least one negative group is functioning as a backbone structure for at least one positive group or ion.

9. A metal element according to claim 8, whereby said positive ion is selected from the group consisting of the transition elements of the periodic table of elements, the earth alkali elements and the elements from group III and IV.

10. A metal element according to any one of the preceding claims, whereby said metal element comprises an elongated metal element.

11. A metal element according to claim 10, whereby said elongated metal element comprises a metal wire, a metal cord or a metal tape.

12. A metal element according to any one of the preceding claims, whereby said metal element comprises a structure comprising at least one elongated metal element.

13. A metal element according to claim 12, whereby said structure comprises a woven, non-woven, braided, knitted or welded structure.

14. A metal element according to any one of the preceding claims, whereby said metal element is coated with a metal or metal alloy coating.

15. A metal element according to claim 14, whereby said metal or metal alloy comprises zinc or a zinc alloy.

16. An article comprising at least one element as defined in any one of claims 1 to 15 embedded in a polymer material.

17. An article according to claim 16, whereby said polymer material comprises a thermoplastic material.

18. A method to coat a metal element with a self-assembled coating layer by electrochemical anodic polymerisation starting from a solution of a monomer of an inherently conductive polymer and at least one dopant, said self-assembled coating layer comprising an inherently conductive polymer and at least one negative group, whereby said inherently conductive polymer is functioning as a backbone structure for said negative group and said negative group being derived from said dopant.

19. A method according to claim 18, whereby said metal element is functioning as anode.

20. A method to improve the corrosion resistance of a metal element by applying a self-assembled layer, said self-assembled layer comprising an inherently conductive polymer and at least one negative group, whereby said inherently conductive polymer is functioning as a backbone structure for said negative group and whereby said negative group is chosen in such a way to increase the corrosion resistance of the metal element.

21. A method according to claim 20, whereby said negative group is selected from the group consisting of phosphates, chromates, nitrates, oxalates, benzoates and citrates.

22. A method to improve the adhesion of a metal element to a polymer material by applying a self-assembled coating layer on a metal element and embedding said metal element with said self-

assembed coating layer in a polymer material, said self-assembled coating layer comprising an inherently conductive polymer and at least one negative group, whereby said self-assembled coating layer is functioning as a backbone structure for at least one positive group or ion and whereby said positive group or ion is chosen in such a way to improve the adhesion with said polymer material.

23. A method according to claim 22, whereby said polymer material comprises a thermoplastic material.

**24.** A method according to claim 22 or 23, whereby said positive ion is selected from the group consisting of the transition elements of the periodic table of elements, the earth alkali elements and the elements from group III and IV.